Department of Energy
Fermi Area Office
Post Office Box 2000
Batavia, Illinois 60510

MAY 17 2007

Dr. Bruce L. Chrisman
Chief Operating Officer
Fermilab
P.O. Box 500
Batavia, IL 60510

Dear Dr. Chrisman:

SUBJECT: SAFEGUARDS AND SECURITY INSPECTION OF FERMI NATIONAL ACCELERATOR LABORATORY (FERMILAB), MARCH 5-8, 2007

Reference: Memorandum, T Gradle to J. Livengood, dated 5/10/07, Subject: Same As Above

The enclosed memorandum formally transmits a copy of the final report of the Safeguards and Security Inspection conducted of Fermilab by the Chicago Office, Safeguards and Security Services during the subject period. The inspection resulted in one finding and three suggestions. An overall rating of **SATISFACTORY** is assigned.

If the Laboratory has any questions concerning this correspondence, please contact Ed Bucki at extension 4891 or Tom Gradle at (630) 252-2052. Thank you.

Sincerely,

Joanna M. Livengood

Dr. Joanna M. Livengood
Site Manager

Enclosure:
As Stated

cc: P. Oddone, w/o encl.
Y.-K. Kim, w/o encl.
D. Carlson, w/encl.
W. Griffing, w/encl.
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All Other Editions are Obsolete

U.S. Department of Energy

SURVEY/INSPECTION REPORT FORM

1. Survey Type: ☐ Initial ☑ Periodic ☐ Special ☐ Termination ☐ EPR ☐ NPR ☐ OA		2. Report # 07MAR05-CH-0733-SSPS
3. Facility Name: FERMI NATIONAL ACCELERATOR LABORATORY		4. a. Facility Code: 0733 b. RIS Code: CWA
5. Survey Date(s): MARCH 5-8,2007	6. a. Findings: ☑Yes ☐ No b. Findings Against Other Facilities:	7. Composite Rating: SATISFACTORY
8. Previous Survey Date(s): DECEMBER 6-9, 2004	9. Unresolved Findings: ☐Yes ☑ No	10. Previous Rating: SATISFACTORY
11a. Surveying Office: CH	11b. Cognizant Security Office:	11c. Other Offices with Interests:

12. Ratings:

a) PROGRAM MANAGEMENT AND SUPPORT	
PROTECTION PROGRAM MANAGEMENT	S
Program Management and Administration	S
Resources and Budgeting	S
Personnel Development and Training	S
S&S PLANNING AND PROCEDURES	S
MANAGEMENT CONTROL	S
Surveys and Self Assessment Programs	S
Performance Assurance Program	S
Resolution of Findings	S
Incident Reporting and Management	S
PROGRAM WIDE SUPPORT	S
Facility Approval and Registration of Activities	S
Foreign Ownership, Control or Influence	D
Security Management in Contracting	S
OVERALL RATING	S
b) PROTECTIVE FORCE	
MANAGEMENT	S
TRAINING	S
DUTIES	S
FACILITIES AND EQUIPMENT	S
OVERALL RATING	S
c) PHYSICAL SECURITY	
ACCESS CONTROLS	S
INTRUSION DETECTION & ASSESSMENT SYSTEMS	S
BARRIERS AND DELAY MECHANISMS	S
TESTING AND MAINTENANCE	S
COMMUNICATIONS	S
OVERALL RATING	S
d) INFORMATION PROTECTION	
BASIC REQUIREMENTS	D
TECHNICAL SURVEILLANCE COUNTERMEASURES	D
OPERATIONS SECURITY	D
CLASSIFICATION GUIDANCE	D
CLASSIFIED MATTER PROTECTION & CONTROL	D
Control of Classified Matter	D
Special Access Programs and Intelligence Information	D
OVERALL RATING	D

e) CYBER SECURITY	
CLASSIFIED CYBER SECURITY	D
Leadership, Responsibilities and Authorities	D
C&A, Risk Management and Planning	D
Policy, Guidance and Procedures	D
Technical Implementation	D
Performance Eval Feedback & Continuous Improvement	D
TELECOMMUNICATIONS SECURITY	D
UNCLASSIFIED CYBER SECURITY	S
Leadership, Responsibilities and Authorities	S
C&A Risk Management and Planning	S
Policy, Guidance and Procedures	S
Technical Implementation	S
Performance Eval Feedback & Continuous Improvement	S
OVERALL RATING	S
f) PERSONNEL SECURITY PROGRAM	
ACCESS AUTHORIZATIONS	D
HUMAN RELIABILITY PROGRAM	D
CONTROL OF CLASSIFIED VISITS	D
SAFEGUARDS AND SECURITY AWARENESS	D
OVERALL RATING	D
g) UNCLASSIFIED VISITS & ASSIGNMENTS BY FOREIGN NATIONALS	
SPONSOR PROGRAM MANAGEMENT & ADMIN	S
COUNTERINTELLIGENCE REQUIREMENTS	S
EXPORT CONTROLS/TECH TRANSFER REQUIREMENTS	S
SECURITY REQUIREMENTS	S
APPROVALS AND REPORTING	S
OVERALL RATING	S
h) NUCLEAR MATERIALS CONTROL & ACCOUNTABILITY	
PROGRAM ADMINISTRATION	S
MATERIAL ACCOUNTABILITY	S
MATERIALS CONTROL	S
OVERALL RATING	S

13. Report Prepared by: SOLITA M. GREENE Date: MAY 1, 2007	14. Report Approved by: THOMAS A. GRADLE, DIRECTOR Date: MAY 1, 2007 Thomas A. Gradle
15. Distribution: CH, SO-11, OA-10, SC-60, FSO	
16. General Comments:	

SURVEYS: S – Satisfactory M – Marginal U – Unsatisfactory D – Does Not Apply NR – Not Rated (SPEC only)
INSPECTIONS: EP – Effective Performance NI – Needs Improvement SW – Significant Weakness D – Does Not Apply

7.0 ASSESSMENT OF THE NUCLEAR MATERIALS CONTROL AND ACCOUNTABILITY (MC&A) PROGRAM - SATISFACTORY

This portion of the survey included a review and evaluation of the Fermilab Nuclear Material Control and Accountability (MC&A) program effectiveness and compliance with DOE directives. This review encompassed the following topical areas: Program Administration, Materials Accounting, Material Control, and Inventory Verification.

There were no findings in the MC&A topical area. Fermilab's nuclear material inventory is static, with only one nuclear material transaction to record decay of two Californium 252 sources reported during the period covered by this survey. The MC&A program continues to provide reasonable assurance that nuclear materials have been accounted for and that identified protection needs have been met. The Nuclear Material Control and Accountability Program is therefore rated **Satisfactory**.

7.1 Program Administration

The objective of the MC&A program is to provide a basis for planning, implementing and evaluating an information and control system with associated checks and balances sufficient to detect and assist in the prevention of the unauthorized use and removal of nuclear materials from the facility or its authorized location. The Program Administration portion of this survey is rated **Satisfactory**.

Organization

Operation of Fermilab's MC&A Program is the responsibility of the Environment, Safety, and Health (ES&H) Section. A staff member of the Radiation Physics Team has been designated as the facility Nuclear Materials Representative. A second Radiation Physics Team member has been assigned as the facility nuclear materials custodian. The NMR had training in Nuclear Materials Management and Safeguards System (NMMSS) reporting, and Basic Nuclear Materials Accounting. The ES&H Section has completed a training needs assessment for each staff member with assigned MC&A program responsibilities, as well as a Training Approval Program (TAP) Self Evaluation Matrix for the MC&A Program. Training records for ES&H section personnel with MC&A responsibilities address both formal training courses and task oriented on the job training.

MC&A Plan

The current Fermilab MC&A Plan and the accompanying Nuclear Materials Control and Accountability Implementation Plan were approved by Fermilab management in January 2007. These plans were reviewed and found to address all required program elements.

Incident Investigation and Reporting

Incidents involving nuclear materials may require reporting under DOE Manual 470.4-1 Change 1, Section N "Incidents of Security Concern" (08/26/2005) and DOE Manual 231.1-2 "Occurrence Reporting and Processing of Operations Information" (8/19/2003). Reporting under DOE Manual 470.4-1 is required for incidents involving: actual or suspected loss, theft or diversion of special nuclear material or radioactive materials that could pose a health threat or endanger security; SNM found in an exceptionally dangerous/hazardous unapproved storage environment, or unapproved mode of transportation/transfer; inventory differences in excess of alarm limits; shipper/receiver differences that are statistically significant or involve item discrepancies; or loss detection indicators. Reporting under DOE Manual 231.1-2 is required for incidents involving loss of control of radioactive materials, technical safety requirement violations, nuclear criticality safety, operational emergencies, personnel injury, or spread of radioactive contamination.

Fermilab maintains procedures for reporting of incidents under the appropriate incident reporting method which are documented in Section N of the MC&A Plan. There were no incidents in the past 24 months that involved the loss of control of nuclear materials.

Assessment Programs

The Assessment Programs subtopic encompasses the internal assessment and program oversight functions of the facility's MC&A Program. Each facility must periodically assess the overall performance of the MC&A program. This assessment should include a review practices and procedures to assure that material controls are effective.

The most recent self-assessment of the Fermilab MC&A Program was completed in January, 2006. The self assessment was performed by the leader of the ES&H Section Hazard Control Technology Team and the Alternate Nuclear Materials Representative. The self assessment included a thorough review of program documentation, training records, program procedures, accounting system reports and logs, and computerized records and spreadsheets. It also included a review of findings and recommendations from the prior self-assessment to ensure that corrective actions had been implemented and fully corrected the noted program deficiencies. The self assessment noted that revisions were needed to the MC&A Plan and its implementation plan to reflect the issuance of DOE Manual 470.4-6, "Nuclear Materials Control and Accountability" of 8/25/2005. The self assessment also recommended that a weight field be added to the On Site Transfer Log to more clearly identify materials being transferred.

7.2 Material Accountability

Materials accounting involves the completeness, accuracy and timeliness of the accountability record system. The materials accounting portion of this survey consisted of an interview with Nuclear Materials Representative and a review performed on internal and external accounting records, reports and procedures. Material accountability at Fermilab is rated **Satisfactory**.

Accounting System Procedures

Fermilab has written procedures for maintaining the nuclear materials accounting system. The procedures were reviewed and found to be consistent with DOE nuclear materials accounting and reporting requirements.

Account Structure

Fermilab is arranged as a singe Material Balance Area. The Nuclear Materials Representative maintains files of nuclear material transactions in chronological order that due to the limited number of transactions may be easily segregated by material type.

Records and Reports

The Fermilab records and reporting system provides information on all nuclear material transactions. Material Balance Reports (MBRs) are prepared quarterly and are submitted to DOE-CH for four material types [Depleted Uranium, Americium 241, Californium 252, and Deuterium]. Fermilab discontinued reporting Californium 252 in June 2006, when a cumulative decay transaction was reported reducing the site inventory to less than a reportable quantity. All MBRs are prepared manually and submitted on a timely basis. All reports were checked for accuracy and proper reporting to the NMMSS Data base. The Composition of Ending Inventory (COEI) Reports are prepared and submitted to DOE-CH quarterly. These reports summarize the nuclear material inventory by project number and composition code. All COEI reports were reviewed and no discrepancies were noted. The accounting system includes logs for receipts and shipments, on site transfers, and adjustments to inventories.

System Assurance

Accounting system records are stored in a locked file cabinet in the ES&H Section offices in Wilson Hall. Access to the file cabinet is limited to the nuclear material representative and the alternate. The computerized inventory database is maintained in an Oracle database on the ES&H Section file server. The database may be accessed through a web interface that is password protected. The interface consists of Java applets running on the Oracle application server. The accounting system includes a series of excel spreadsheets that are linked to the Oracle database and are used to produce reports. The user can specify the date for a given report and refresh the data for that time period. The ES&H Section file server is backed up to tape on a daily basis.

Physical Inventories

Fermilab performs an annual physical inventory of nuclear materials and reports the results of this inventory to the DOE Fermi Site Office. Physical inventories were completed and reported in December 2006, March 2006, and March 2005. Additionally, the sealed sources are leak tested and inventoried by ES&H Section personnel on a monthly basis.

Measurements

The Fermilab nuclear material inventory consists of sealed sources and depleted uranium metal, and deuterium gas. Physical inventories are based primarily on item identification. The ES&H Section radiation instruments used to survey inventory items and perform contamination surveys of the sealed sources. Deuterium gas may be measured by PVT calculations using measured pressures and temperatures combined with known cylinder and tank volumes.

Material Transfers

The ES&H Section is responsible for all receipts and shipments of nuclear material at Fermilab. Receipts of nuclear material are verified prior to issuance or storage. The Nuclear Materials Representative completes the Nuclear Material Transaction Report (Form 741) and reconciles the receipt data to the shipper's data. There were no transfers of nuclear materials in the period covered by this survey.

Material Control Indicators

The Fermilab MC&A system provides procedures for reporting and investigating inventory differences and missing material. There were no Inventory Differences, Shipper/Receiver Differences, Normal Operational Losses, or Accidental Losses of nuclear materials in the period covered by this survey.

Decay of Californium 252 and Americium 241 is reported when the cumulative amount of decay reaches a reportable quantity. A total of 1 microgram of Cf-252 decay reported during the survey period. This reduced the total inventory of Cf-252 to below a reportable quantity.

7.3 Material Control

The material control function encompasses the process of identifying persons needing access to nuclear materials, authorization of access to nuclear material, documentation, and maintaining a system of checks and balances. Fermilab's system for the control of nuclear materials and the control of access to the MC&A system and system data was found to be **Satisfactory**.

Material Access

Fermilab is approved as a Category IV facility. The current inventory consists of only source and other nuclear materials (Depleted Uranium, Americium, Deuterium, and less than reportable quantities of Cf-252). Access to nuclear materials is limited to authorized persons and is documented in an on-site transfer log.

Data Access

Accounting system records are stored in a locked file cabinet in the ES&H Section offices in Wilson Hall. Access to the file cabinet is limited to the nuclear material representative and the alternate. The computerized inventory database is maintained in an Oracle database on the ES&H Section file server. The database may be accessed through a web interface that is password protected. The interface consists of Java applets running on the Oracle application server. The accounting system includes a series of Excel spreadsheets that are linked to the Oracle database and are used to produce reports. The user can specify the date for a given report and refresh the data for that time period. The database and accounting system data is backed up to tape on a daily basis.

Material Surveillance

Fermilab's material surveillance requirements are documented in Section L of the MC&A Plan. Nuclear materials are required to be stored in a locked room or storage area when not in use or attended. Each nuclear material storage location was capable of being locked.

Material Containment

Material Containment encompasses the physical barriers, plans, and procedures in place to restrict nuclear materials to authorized locations. Fermilab is configured as a single Material Balance Area (MBA) with defined workplaces for the use and storage of nuclear materials. All areas where nuclear materials are used or stored are kept locked when not attended.

Material Transfers

All shipments and receipts of nuclear material are controlled by the ES&H Section. When materials arrive on site, Fermilab Shipping/Receiving notifies the ES&H Section. The E&SH Section that the received material is verified and transferred to the appropriate Laboratory Division or section where they the materials will be used. The ES&H Section performs transfer checks and provides transaction documentation for all nuclear materials received at and shipped from the Fermilab site.

Tamper Indicating Devices (TIDs)

Fermilab maintains a supply of paper seals which are used in the control of shipments of radioactive materials. There have been no shipments of nuclear materials in the period covered by this survey and none are anticipated in the foreseeable future.

7.4 Inventory Verification

Fermilab is configured as a single Material Balance Area. The nuclear material inventory consists of sealed sources used for calibration, depleted uranium, and deuterium gas.

Radiation Physics Calibration Facility (RPCF – Site 38) – The RPCF is a concrete shielded facility with a room containing a concrete coffin for the storage of neutron sources. The facility also contains an exposure room and a projector room in the concrete enclosure. The RPCF is kept locked and alarmed when not attended. Nuclear materials in this area include four Americium 241/Beryllium neutron sources, one small Americium 241 source, and two Californium 252 neutron sources. The Cf-252 sources have decayed to the point where the total quantity of contained Cf-252 is no longer reportable. The sources may be signed out by authorized members of the ES&H Section staff for use in calibration. A logbook is maintained to record the use of the sources. The sources are leak checked and inventoried on a monthly basis.

Site 40 – The Site 40 building serves as the office and work areas for ES&H Section staff. The nuclear materials stored at Site 40 consist of 2 kilograms of depleted uranium metal in the form of thin targets and small metal bars. These materials are kept in a locked source cabinet in a locked workroom adjacent to the building high bay area.

Railhead Area – Deuterium Storage – Fermilab maintains an inventory of 81.4 kilograms of deuterium gas contained in 4 large storage tanks and 123 cylinders housed in a locked fenced area outside of the Lundy Barn in the Railhead area. The deuterium gas is inventoried on an annual basis.

D0 Assembly Building – D0 (pronounced D Zero) is one of the two large detectors that collect data from particle collisions in the Tevatron. A major component of the D0 detector modules consists of 237,792 kilograms of depleted Uranium in the form of metal and Uranium/Niobium metal alloy plates. The detector is enclosed in a cryostat, which is filled with liquid argon when the detector is in use. At the time of this survey, the detector was inside of its enclosure (aligned with the Tevatron beam tube) with a shield wall made of large concrete blocks in place. A D0 test cryostat containing 21,016 kilograms of depleted uranium is kept in a locked fenced area adjacent to the D0 assembly building.

KTeV Experimental Hall – The experimental apparatus for the Kaons at the Tevatron (KTeV) experiment includes 1,863 kilograms of depleted uranium encased in 16 steel plates mounted in the beam line. The KTeV building is kept locked when unattended and access is limited to authorized Particle Physics Division and ES&H Section staff.

Me Muon Area – Three items of depleted uranium are stored in a building designated as the ME-7 Worm, which is kept locked when unattended. These items include 529 kilograms as a prototype CCEM module, 98 kilograms in the form of 28 8" x 8" plates stored in a steel canister, and a target wheel containing 0.038 kilograms of depleted uranium metal that had been used in the E709 experiment.

Meson Area MC-7 – Two cylinders of deuterium gas are stored in a cylinder rack in a fenced area adjacent to the MC-7 enclosure. The fenced area is kept locked.